Listing of the Claims

This listing of claims will replace all prior versions and listings of claims in the application.

1. (previously presented) A method of quantifying data to determine possible presence of a target analyte in a specimen in which a sample of said target analyte is placed upon a membrane having a spot region that, in the presence of said target analyte, changes at least one optical characteristic relative to surrounding regions of said membrane, the method comprising the following steps:

(a) alternately and periodically illuminating said surrounding regions of said membrane and said spot region with light from a light source, said light traversing an air path undeflected by any planar optical element disposed between said light source and said membrane;

(b) detecting light reflected from said spot region and from said surround regions of said membrane with light detectors disposed so as to reduce skew error due to irregularities in topography of said membrane, reflected said light traversing an air path undeflected by any planar optical element disposed between said light detectors and said membrane;

(c) signal processing output from said light detectors to discern from optical characteristic information of said spot region relative to optical characteristic information of said surrounding regions of said membrane presence of said target analyte; and

(d) providing an output signal commensurate with an output from said signal processing.

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21. (Previously presented) The method of claim 1, step (b) includes disposing said detectors spaced-apart from each other with an azimuthal angular offset selected from a group consisting of 90° and 180°.

22. (Previously presented) The method of claim 1, wherein at step (c) said optical characteristic includes at least one characteristic selected from a group consisting of (I) color, (ii) color density, (iii) optical density, and (iv) relative contrast of reflected said light.

23. (Previously presented) The method of claim 1, wherein at step (a) said light source includes at least one light source selected from a group consisting of (I) a source of visible light, (ii) a source of non-visible light, (iii) at least one LED, (iv) at least one laser diode, (v) a source of incandescent light, (vi) a source of X-rays, (vii) a source of ultra-violet, (viii) a source of infra-red, (ix) a source of diffuse light, (x) a source of non-diffuse light.

24. (Previously presented) The method of claim 1, wherein step (a) includes at least one step selected from a group consisting of (i) illuminating said spot region with a circular light pattern and illuminating said surrounding regions with annular light patterns, (ii) illuminating said spot region with a circular light pattern and illuminating at least one of said surrounding regions with a circular light pattern, (iii) illuminating at least one of said spot region and said surrounding regions with a non-circular light pattern, (iv) illuminating using multiple light sources, (v) illuminating from a single light source, (vi) alternately and periodically illuminating with a frequency ranging from about 100 Hz to about 10 KHz, and (vii) alternately and periodically switching illumination from said spot region to said surrounding regions.

25. (Previously presented) The method of claim 1, wherein:

step (a) includes illuminating at least one of said spot region and said surrounding regions with a circular light pattern, wherein said spot region and said surrounding regions lie on a first line; and

step (b) includes disposing said light detectors on a second line normal to said first line such that said spot region and said surrounding regions are each substantially equidistant from said light detectors.

26. (Previously presented) The method of claim 1, wherein at step (a) said light source is a single source of light, and step (a) further includes alternately and periodically illuminating by selectively passing light from said light source through a component selected from a group consisting of (I) a rotatable disk defining through openings placed and sized to pass light directed to at least one chosen region of said membrane, (ii) an electronic shutter defining regions selectively made transparent to pass light directed to at least one chosen region of said membrane, and (iii) a liquid crystal shutter defining regions selectively made transparent to pass light directed to at least one chosen region of said membrane.

27. (Previously presented) The method of claim 1, wherein signal processing at step (c) includes improving signal/noise ratio by subtracting measured light intensity from said spot region from measured light intensity of said surrounding regions.

28. (Previously presented) The method of claim 1, wherein at step (d), said output signal includes at least one signal selected from a group consisting of (I) a representation of a ratio of measured reflected light from said spot region to measured reflected light from said surrounding regions, (ii) a representation of a ratio of measured reflected light from said surrounding portions to measured intensity of illumination of said surrounding portions, (iii) a ratio of ratios, a first ratio representing measured reflect light from said spot region relative to measured intensity of illumination of said portion, and a second ratio representing of measured reflected light from said surrounding portions relative to measured intensity of illumination of said surrounding portions, (iv) a visual signal, (v) a printed output, (vi) a digital computer-interface signal, (vii) an audible sound having at least one acoustic characteristic proportional to said output signal, and (viii) an audible enunciation of at least one word appropriate to said output signal.

29. (Previously presented) The method of claim 1, further including at least two steps carried out synchronously with periodicity of illuminating in step (b) selected from a group consisting of:

(I) measuring intensity of light reflected by said spot region and measuring intensity of light reflected by said surrounding regions;

(ii) combining inverted and non-inverted signals representing measured light intensity reflected by said spot region and measured light intensity reflected by said surrounding regions; and

(iii) switchably sampling signals representing an inverted amplified version and a non-inverted amplified version of measured reflected light intensities.

30. (Previously presented) The method of claim 1, wherein step (a) includes alternatively and periodically illuminating at a chosen frequency in a range of about 100 Hz to about 10 KHz.

31. (Previously presented) The method of claim 1, further including, prior to providing said output signal, filtering at least one signal measured at step (b) to reduce frequency components resulting from said alternatively and periodically illuminating.

32. (Previously presented) The method of claim 1, wherein said target analyte includes at least one analyte selected from a group consisting of (I) nucleic acids, (ii) antigens, (iii) antibodies, (iv) haptens, (v) hapten conjugates, (vi) macro-molecules, (vii) proteins, (viii) polymers, and (ix) chemicals.

33. (Previously presented) The method of claim 1, wherein emitted said light traverses paths through air different from paths traversed by reflected said light.

34. (Previously presented) A reflectometry system to measure intensity of a spot on a substrate relative to intensity of a surrounding area of said substrate, said spot being exposable to a target analyte, the system including:

a master clock unit outputting at least a periodic master clock signal having a clock frequency and duty cycle;

at least one light source, coupled to an output of said master clock unit, emitting light controllably directed at said spot and controllably directed at said surrounding area, emitted said light traveling substantially through air in a path undeflected by any planar optical element disposed between said light source and said substrate;

first and second spaced-apart light detectors to detect fractions of emitted said light reflected by said surrounding area and by said spot, said first and second detectors disposed so as to reduce skew errors from irregularities in topography of said substrate, reflected said light traveling to said detectors substantially through air in a path undeflected by any planar optical element disposed between said light source and said substrate;

circuitry, operatively synchronously with said master clock signal, to synchronously and complementarily sample and process output signals from said first and second light detectors, to provide data quantifying said target analyte.

35. (Previously presented) The system of claim 34, wherein:

said circuitry further substantially reduces output signal responses from said first and second light detectors in absence of reflect light, and

said circuitry includes AC-coupling so as to reduce offset drift.

36. (Previously presented) The system of claim 34, wherein said circuitry includes a lock-in amplifier system.

37. (Previously presented) The system of claim 34, wherein said circuitry includes:

a summing amplifier coupled to amplify and process output signals from said first and second light detectors to yield an average summed signal;

a non-inverting amplifier and an inverting amplifier AC-coupled to receive as input said average summed signal;

a switch coupled to alternatively sample, synchronously with said master clock signal, an output of said non-inverting amplifier and an output of said inverting amplifier, such sampling occurring during a transition free interval of an active portion of said master clock signal duty cycle when which said light source actively emits light;

wherein an output of said switch includes an average component representing data quantifying presence of said target analyte.

38. (Previously presented) The system of claim 34, wherein said at least one light source illuminates said substrate in at least one manner selected from a group consisting of (i) said spot and said surrounding area are alternately illuminated, (ii) said spot and said surrounding area are simultaneously illuminated, and (iii) only said spot is illuminated and alternatively said surrounding area but for said spot is illuminated.

39. (Previously presented) The system of claim 34, wherein said at least one light source is selected from a group consisting of (i) a source of visible light, (ii) a source of non-visible light, (iii) at least one LED, (iv) a laser diode, (v) a source of incandescent light, (vi) a source of X-rays, (vii) a source of ultra-violet, (viii) a source of infra-red, (ix) a source of diffuse light, (x) a source of non-diffuse light.

40. (Previously presented) The system of claim 34, wherein emitted said light traverses paths through said air different from paths traversed by reflected said light.